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EXAMINER	
OLSEN, KAJ K	

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1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/621,999	SHEN ET AL.	
	Examiner	Art Unit	
	KAJ K. OLSEN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,17-74 and 76-113* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,17-74 and 76-113* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Reissue Applications

1. Claims 2, 17-74, and 76-113 are rejected under 35 U.S.C. 251 as being broadened in a reissue application filed outside the two year statutory period. In each of claims 79-82, 86-89, and 92, the preamble of the claims has been broadened from "for quantitative measurement" in the originally filed claims to "for measurement." This is a broadening of the scope of the claims. In each of claims 30, 47, 59, 86-89, 92, 95, and 97, the limitation beginning "whereby...", the limitation "means detects changes" has been broadened to "means is capable of detecting changes." In each of claims 30, 47, 59, 86-89, 92, 95, and 97 the limitation "the sensing electrode reacting" has been broadened to "the sensing electrode being capable of reacting." A claim is broader in scope than the original claims if it contains within its scope any conceivable product or process which would not have infringed the original patent. A claim is broadened if it is broader in any one respect even though it may be narrower in other respects.

2. Claims 2, 17-74, and 76-113 are rejected under 35 U.S.C. 251 as being improperly broadened in a reissue application made and sworn to by the assignee and not the patentee. A claim is broader in scope than the original claims if it contains within its scope any conceivable product or process which would have infringed the original patent. A claim is broadened if it is broader in any one respect even though it may be narrower in other respects. See the discussion above for the instances of broadening in all of the pending claims.

3. The amendment filed January 13, 2009 proposes amendments to claims 2, 17, 18, 27, 30, 47 and 59 that do not comply with 37 CFR 1.173(b), which sets forth the manner of making amendments in reissue applications. A supplemental paper correctly amending the reissue application is required.

4. Note that all matter to be deleted from the patent should be bracketed within single brackets; there should not be double brackets or strike-through.

Res Judicata

5. Claims 95 and 96 of this reissue are identical to the claims 79 and 80 presented to the Board of Appeals in Reexamination 90/006,208. The rejection of these claims was affirmed in the Board decision of 5/23/2007. Hence, these claims 95 and 96 are rejected on the grounds of *Res Judicata* and the applicant is not entitled to further adjudication of the issues concerning these claims.

Oath/Declaration

6. The newly submitted declaration of 9/22/2008 overcome the objection of the previous declaration, but is also defective because this new declaration states incorrectly states what the supposed error was. In particular, patentee states that the original patent is wholly or partly inoperative or invalid because patentee claimed less than they had the right to claim (patentee explicitly crossed out the "more or" off of that line). Because patentee is outside of the two-year limit for filing broadening reissues, then the supposed error cannot be that the applicant claimed less than they were

entitled to as patentee is barred from doing so (see MPEP 1412.02). Moreover, if the error was that the patentee claimed less than they had the right to, then the declaration cannot be perfected by the assignee, but must be signed by all the inventors (see MPEP 1414.01(III)). A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 79, 81, 86, 88, and 97 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey et al (USP 4,227,984) in view of Nagata et al (USP 4,913,792) and any of Vanderborgh et al (USP 4,804,592), Uchida et al (USP 5,474,857) and/or Grot et al (USP 5,330,860).

10. With respect to claim 79, Dempsey discloses an electrochemical gas sensor that comprises a sensing electrode 13, a counter electrode 10, with a protonic conductive electrolyte membrane 9 between and in contact with both the sensing and counter electrodes (fig. 2). Dempsey teaches the use of a membrane with a thickness that reads on the claimed thickness (col. 11, lines 58-60). The sensing electrode reacts with the gas to be measured and the sensor has a means for electrical measurement (fig. 3). With respect to the area of the electrodes, see col. 11, lines 65-67. 1.6 cm would read on "approximately…15 mm" giving the claim language its broadest reasonable interpretation. Dempsey does not explicitly teach the use of sensing and counter electrodes that contain both ionically and electrically conductive materials. Dempsey does recognize that the electrodes set forth in the fuel cell prior art find utility for the sensor of Dempsey (col. 8, lines 30-63). In the fuel cell art, it is common to utilize a combination of ionically and electrically conductive material for the electrodes for fuel cells. In particular, Vanderborgh and Grot teach the use of a combination of said materials and teaches that said combination of materials provides a fuel cell with improved efficiency and internal resistance (col. 2, lines 42 and 43 of Vanderborgh and col. 4, lines 26-29 of Grot). Uchida teaches a particular electrode for use in fuel cells that is a combination of proton conducting material and electrically conducting material. Grot also teaches the use of fuel cell electrodes having both ionically and electrically conductive materials that also satisfy the claimed compositions (col. 4, line 35 through col. 5, line 2; and col. 14, lines 15-27). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of any of

Vanderborgh, Uchida, and/or Grot for the sensor of Dempsey because these electrodes have shown previous favorable utility in the fuel cell art, and the substitution of one known fuel cell electrode composition for another, when the results are not unexpected, requires only routine skill in the art. Furthermore, the addition of ionically conductive material to the electrode would improve the effective resistance of the electrodes as well as facilitate the removal of the solid-solid interfaces between the electrodes and the membrane (Vanderborgh, col. 2, lines 25-43). Although the secondary references are drawn principally towards fuel cell power sources, Uchida and Grot both recognized the utility of their teachings to fuel cell based sensors like those of Dempsey (see Uchida, col. 10, lines 60-64; and Grot, col. 1, lines 19-30). In addition, Dempsey recognized the utility of the teachings from the general fuel cell art for the disclosed sensor (col. 8, lines 30-63).

11. Dempsey also did not teach that the sensing and counter electrodes are the only two electrodes in contact with the first protonic conductive electrolyte membrane. Rather Dempsey taught the addition of a third reference electrode 32 that is also in contact with the membrane. However, Nagata teaches that it is not necessary to utilize a reference electrode to stabilize the potential of the working electrode as long as the counter electrode is large enough to help maintain a stable potential at the working electrode. Nagata also teaches that such a two-electrode cell simplifies the circuitry as it obviates the need for a potentiostat to control the potential of the working electrode. Compare fig. 1 with fig. 8 and see col. 7, l. 66 - col. 8, l. 11. Because Nagata teaches that both two and three electrode gas sensors were known in the art and that sensors

were readily transferable between the two, and further taught that two-electrode sensors have simplified circuitry, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize only two-electrodes for the sensor of Dempsey in view of Vanderborgh, Uchida, and/or Grot as taught by Nagata because the substitution of one known sensor structure (two-electrode) for another known structure (three-electrode) requires only routine skill in the art. In addition, the use of a two-electrode configuration has the added advantage of being simpler to construct and operate.

12. With respect to claim 81 (those limitations not covered above), because the electrode of Dempsey in view of Vanderborgh, Uchida, and/or Grot already rendered obvious the combination of catalytic electronic conducting material (e.g. Pt) and ion conducting material (e.g. Nafion) for the electrodes with overlapping composition to the electrodes of the instant invention, then such an electrode would inherently be capable of reacting with a gas in the absence of an applied voltage to the sensing electrode. The fact that Dempsey operates its sensor using an applied voltage to the sensing electrode does not read free of this limitation because whether or not a voltage is applied is how the sensor is to be utilized and does not further define the structure of the device.

13. With respect to claims 86 and 88 (those limitations not covered above), whether or not the sensor is operated at room temperature is only the intended use of the apparatus and the intended use need not be given further due consideration in

determining patentability. It is noted however that the sensor of Dempsey can be utilized at room temperature as evidenced by col. 2, ll. 30-35.

14. With respect to new claim 97, this claim appears to comprise almost entirely limitations already addressed previously. With respect to the use of the specified copolymer of tetrafluoroethylene backbone with a side chain of perfluorinated monomers containing a sulfonic group, each of Vanderborgh, Uchida, and Grot specify the use of Nafion as the polymer being mixed with the electrode material (see the discussion above) and Nafion is inherently a copolymer of tetrafluoroethylene backbone with a side chain of perfluorinated monomers containing a sulfonic group. See the present invention specification col. 6, ll. 40-46. With respect to the specified thickness of 0.17 mm for the membrane, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize a thinner membrane than that set forth by Dempsey in order to further reduce the internal resistance of the sensor. With respect to approximately 0.17 mm, finding the optimal thickness requires only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). With respect to the specific use of 15 mm for the sensing electrode, this is so close to the 16 mm of Dempsey that it constitutes an obvious difference over the area relied on by Dempsey. There is no particular criticality disclosed by the present invention for the specific use of 15 mm, nor is there any criticality to the use of 16 mm by the teaching of Dempsey. Both the thickness and diameter positions were affirmed in the Appeal decision of 90/006,208.

15. Claims 79-101, 103-106, and 108-113 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomantschger et al (USP 5,173,166) (hereafter "Tomantschger '166") in view of Dempsey and any or Vanderborgh, Uchida, and/or Grot.

16. With respect to claim 79, Tomantschger '166 discloses a two-electrode electrochemical gas sensor for measuring a gas in an ambient atmosphere (col. 5, ll. 27-32) comprising a porous sensing electrode 12 containing electronically conducting material, a porous counter electrode 16 also containing electronically conducting material (col. 8, ll. 13-20 and examples 1-5 of col. 12), and a first protonic conductive electrolyte membrane 24 (col. 6, ll. 61-63) in between and in contact with the sensing and counter electrodes where the sensing and counter electrodes are the only two electrodes in contact with the membrane (fig. 3 for example). Tomantschger '166 discloses that the sensing electrode reacts with the gas to produce a change in electrical characteristic (either a potential or a current) between the sensing electrode and counter electrode (col. 7, ll. 21-33), whereby in a positive ambient concentration of said gas, said electrical measurement detects changes in said electrical characteristics (fig. 6 and 7). Tomantschger '166 does not explicitly disclose the addition of an ionically conducting material to the electrodes of the sensor. However, it is noted that Tomantschger '166 admits that its sensor is essentially functioning as a fuel cell device. See col. 8, ll. 23-28. In the fuel cell art, it is common to utilize a combination of ionically and electrically conductive material for the electrodes for fuel cells. In particular, Vanderborgh and Grot teach the use of a combination of said materials and teaches that said combination of materials provides a fuel cell with improved efficiency and

internal resistance (col. 2, lines 42 and 43 of Vanderborgh and col. 4, lines 26-29 of Grot). Uchida teaches a particular electrode for use in fuel cells that is a combination of proton conducting material and electrically conducting material. Grot also teaches the use of fuel cell electrodes having both ionically and electrically conductive materials that also satisfy the claimed compositions (col. 4, line 35 through col. 5, line 2; and col. 14, lines 15-27). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of any of Vanderborgh, Uchida, and/or Grot for the electrodes of Tomantschger '166 for the sensor of Tomantschger '166 because these electrodes have shown previous favorable utility in the fuel cell art, and the substitution of one known fuel cell electrode composition for another, when the results are not unexpected, requires only routine skill in the art. Furthermore, the addition of ionically conductive material to the electrode of Tomantschger '166 would improve the effective resistance of the electrodes as well as facilitate the removal of the solid-solid interfaces between the electrodes and the membrane (Vanderborgh, col. 2, lines 25-43). Hence, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to add ionically conducting material to the electronically conducting electrodes of Tomanstschger in order to increase the electrode efficiency and reduce its resistance. Uchida and Grot both recognized the utility of their teachings to fuel cell based sensors like those of Tomantschger '166 (see Uchida, col. 10, lines 60-64; and Grot, col. 1, lines 19-30).

17. Tomantschger '166 also did not explicitly disclose either a particular diameter for its electrodes or a particular thickness of protonic conductive electrolyte membrane.

However, the previously relied on Dempsey taught for a different CO sensor that electrodes having a diameter of 16 mm with a Nafion membrane having a thickness overlapping the claimed range provided suitable dimensions for the electrodes and membrane. See col. 11, ll. 58-68. The examiner takes the position that 16 mm either reads on "approximately 1 mm to 15 mm" or is so close to 1-15 mm as to not constitute a patentable distinction. This position was affirmed in the appeal decision for Reexamination 90/006,208 dated 5/23/2007. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the electrode and electrolyte dimensions from Dempsey for the electrodes and electrolyte of Tomantschger '166 because these dimensions have been previously shown to provide effective CO sensitivity. Because Tomantschger '166 did not explicitly disclose any dimensions of electrode diameter or electrolyte thickness, this would lead one possessing ordinary skill in the art to conclude that electrode area and membrane thickness were not critical to the sensor of Tomantschger '166 and would have though to utilize dimensions disclosed from previous successful CO monitors for the construction of the sensor disclosed by Tomantschger '166. The teaching of Dempsey was already identified by Tomantschger '166 as being an effective prior art sensor. See Tomantschger '166, col. 3, ll. 15-20.

18. With respect to claim 80 (those limitations not covered above), the sensing electrode of Tomantschger '166 produces an electrical change in the absence of any applied voltage. See col. 7, ll. 26-33.

19. With respect to claim 81, see the discussion of claims 79 and 80 above.

20. With respect to claims 82-85 (those limitations not covered above), the sensing and counter electrodes are on opposite sides of the protonic conductive electrolyte membrane (see fig. 3).

21. With respect to claims 86-91 (those limitations not discussed above), Tomantschger '166 operates its sensor at room temperature. See col. 5, ll. 27-32.

22. With respect to claims 92-94 (those limitations not covered above), Tomantschger '166 is a non-biased device as they apply no biasing potential to the electrodes.

23. With respect to new claim 95, see the rejection of claim 80 above and note that Tomantschger '166 already suggested the measurement of carbon monoxide (fig. 6 and 7).

24. With respect to claim 96, element 14 of Tomantschger '166 reads on the defined cap of the claims.

25. With respect to claim 97, see the discussion of the previous claims above where most of these limitations were previously covered. With respect to the use of the specified copolymer of tetrafluoroethylene backbone with a side chain of perfluorinated monomers containing a sulfonic group, each of Vanderborgh, Uchida, and Grot specify the use of Nafion as the polymer being mixed with the electrode material (see the discussion above) and Nafion is inherently a copolymer of tetrafluoroethylene backbone with a side chain of perfluorinated monomers containing a sulfonic group. See the present invention specification col. 6, ll. 40-46. With respect to the specified thickness of 0.17 mm for the membrane, it would have been obvious to one of ordinary skill in the

art at the time the invention was being made to utilize a thinner membrane than that set forth by Dempsey in order to further reduce the internal resistance of the sensor. With respect to approximately 0.17 mm, finding the optimal thickness requires only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). With respect to the specific use of 15 mm for the sensing electrode, this is so close to the 16 mm of Dempsey that it constitutes an obvious difference over the area relied on by Dempsey. There is no particular criticality disclosed by the present invention for the specific use of 15 mm, nor is there any criticality to the use of 16 mm by the teaching of Dempsey. Both the thickness and diameter positions were affirmed in the Appeal decision of 90/006,208.

26. With respect to claims 98 and 99, see Tomantschger '166 col. 12, ll. 10-55; Dempsey col. 7, ll. 65-68; Uchida col. 7, l. 55 - col. 8, l. 26; Grot col. 4, l. 35 - col. 5, l. 2 and col. 14, ll. 15-27; and Vanderborgh, table 1.

27. With respect to claim 100, see Dempsey col. 8, ll. 1-29.

28. With respect to claim 101, see Tomantschger '166 col. 11, ll. 3-6

29. With respect to claims 103-106, see Tomantschger '166 claim 20 of the Dempsey abstract.

30. With respect to claim 108 (those limitations not covered above), it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize smaller electrodes for the sensor of Tomantschger in order to make a more compact sensor that utilizes lesser amounts of expensive materials like platinum.

31. With respect to claims 109-113 (those limitations not covered above), Vanderborgh teaches the use of 19 wt% Nafion to 81 wt% of the total C and Pt concentration (see Table 1); Uchida teaches the use of 13 wt% Nafion (col. 7, l. 63 - col. 8, l. 26); and Grot teaches the use of 0-25 wt% Nafion (col. 4, ll. 44-55).

32. Claims 80, 82, 84, 87, 89, 91, 92, 95, 96, 98-101, 103, 104, and 108-113 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of any of Vanderborgh, Uchida and/or Grot.

33. With respect to claim 80, Dempsey discloses an electrochemical gas sensor that comprises a sensing electrode 13, a counter electrode 10, with a protonic conductive electrolyte membrane 9 between and in contact with both the sensing and counter electrodes (fig. 2). Dempsey teaches the use of a membrane with a thickness that reads on the claimed thickness (col. 11, lines 58-60). The sensing electrode reacts with the gas to be measured and the sensor has a means for electrical measurement (fig. 3). With respect to the area of the electrodes, see col. 11, lines 65-67. 1.6 cm would read on "approximately…15 mm" giving the claim language its broadest reasonable interpretation. Dempsey does not explicitly teach the use of sensing and counter electrodes that contain both ionically and electrically conductive materials. Dempsey does recognize that the electrodes set forth in the fuel cell prior art find utility for the sensor of Dempsey (col. 8, lines 30-63). In the fuel cell art, it is common to utilize a combination of ionically and electrically conductive material for the electrodes for fuel cells. In particular, Vanderborgh and Grot teach the use of a combination of said materials and teaches that said combination of materials provides a fuel cell with

improved efficiency and internal resistance (col. 2, lines 42 and 43 of Vanderborgh and col. 4, lines 26-29 of Grot). Uchida teaches a particular electrode for use in fuel cells that is a combination of proton conducting material and electrically conducting material. Grot also teaches the use of fuel cell electrodes having both ionically and electrically conductive materials that also satisfy the claimed compositions (col. 4, line 35 through col. 5, line 2; and col. 14, lines 15-27). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of any of Vanderborgh, Uchida, and/or Grot for the sensor of Dempsey because these electrodes have shown previous favorable utility in the fuel cell art, and the substitution of one known fuel cell electrode composition for another, when the results are not unexpected, requires only routine skill in the art. Furthermore, the addition of ionically conductive material to the electrode would improve the effective resistance of the electrodes as well as facilitate the removal of the solid-solid interfaces between the electrodes and the membrane (Vanderborgh, col. 2, lines 25-43). Although the secondary references are drawn principally towards fuel cell power sources, Uchida and Grot both recognized the utility of their teachings to fuel cell based sensors like those of Dempsey (see Uchida, col. 10, lines 60-64; and Grot, col. 1, lines 19-30). In addition, Dempsey recognized the utility of the teachings from the general fuel cell art for the disclosed sensor (col. 8, lines 30-63). With respect to the limitation concerning the sensing electrode reacting with the gas in the absence of an applied voltage, because the electrode of Dempsey in view of Vanderborgh, Uchida, and/or Grot already rendered obvious the combination of catalytic electronic conducting material (e.g. Pt) and ion conducting material (e.g. Nafion) for the

electrodes with overlapping composition to the electrodes of the instant invention, then such an electrode would inherently be capable of reacting with a gas in the absence of an applied voltage to the sensing electrode. The fact that Dempsey operates its sensor using an applied voltage to the sensing electrode does not read free of this limitation because whether or not a voltage is applied is how the sensor is to be utilized and does not further define the structure of the device.

34. With respect to claims 82 and 84 (those limitations not covered above), the sensing and counter electrodes (31, 33) of Dempsey are on opposite sides of the protonic conductive membrane. See fig. 3.

35. With respect to claims 87, 89, and 91 (those limitations not covered above) whether or not the sensor is operated at room temperature is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability. It is noted however that the sensor of Dempsey can be utilized at room temperature as evidenced by col. 2, ll. 30-35.

36. With respect to claim 92, specifying that the sensor is non-biased in the preamble does not further define the structure of the sensor and merely constitutes the intended use of the structure. Alternatively, the sensor of Dempsey would be non-biased when the potentiostat connected to the electrodes is either disconnected or turned off.

37. With respect to new claims 95, 96, 98-101, 103, 104, and 108-113, see the rejection for claims 79, 80, 3-6, 8, 9, 13-16, and 75 over this same art from Reexamination 90/006,208. The examiner was affirmed in his rejection of those claims.

38. Claims 83, 85, 90, 93, and 94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of any or Vanderborgh, Uchida, and/or Grot as applied to claims 82, 89, and 92 above, and further in view of Nagata.

39. The examiner notes that claim 94 was previously rejected over the teachings of Dempsey in view of any of Vanderborgh, Uchida, and/or Grot. However, the examiner noticed that claim 94 actually depends from claim 93 and not claim 92, so this claim is now being listed in this rejection. This change for claim 94 is not a change in the grounds of rejection, but merely a correction to reflect the appropriate claim dependence for claim 94.

40. With respect to claims 83, 90, 93, and 94 (those limitations not covered previously), the references set forth all the limitations of the claims, but did not specify that the sensing electrode and the counter electrode are the only two electrodes in contact with the electrolyte membrane. Rather Dempsey taught the addition of a third reference electrode 32 that is also in contact with the membrane. However, Nagata teaches that it is not necessary to utilize a reference electrode to stabilize the potential of the working electrode as long as the counter electrode is large enough to help maintain a stable potential at the working electrode. Nagata also teaches that such a two-electrode cell simplifies the circuitry as it obviates the need for a potentiostat to control the potential of the working electrode. Compare fig. 1 with fig. 8 and see col. 7, l. 66 - col. 8, l. 11. Because Nagata teaches that both two and three electrode gas sensors were known in the art and that sensors were readily transferable between the two, and further taught that two-electrode sensors have simplified circuitry, it would

have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize only two-electrodes for the sensor of Dempsey in view of Vanderborgh, Uchida, and/or Grot as taught by Nagata because the substitution of one known sensor structure (two-electrode) for another known structure (three-electrode) requires only routine skill in the art. In addition, the use of a two-electrode configuration has the added advantage of being simpler to construct and operate.

41. With respect to claim 85, because the electrode of Dempsey in view of Vanderborgh, Uchida, and/or Grot already rendered obvious the combination of catalytic electronic conducting material (e.g. Pt) and ion conducting material (e.g. Nafion) for the electrodes with overlapping composition to the electrodes of the instant invention, then such an electrode would inherently be capable of reacting with a gas in the absence of an applied voltage to the sensing electrode. The fact that Dempsey operates its sensor using an applied voltage to the sensing electrode does not read free of this limitation because whether or not a voltage is applied is how the sensor is to be utilized and does not further define the structure of the device.

42. Claim 102 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey with any of Vanderborgh, Uchida, or Grot as applied to claim 82 above, and further in view of Tomantschger et al (USP 5,302,274) (hereafter "Tomantschger '274").

43. The references set forth all the limitations of the claims, but did not explicitly recite the use of a metal oxide protonic conductor electrolyte. Tomantschger '274 teaches in an alternate gas sensor a number of different electrolyte materials useable as for gas sensors including a uranyl hydrogen phosphate tetrahydrate (col. 8, lines 37

and 38). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Tomantschger '274 for the sensor Dempsey in view of any of Vanderborgh, Grot or Uchida because the substitution of one known electrolyte means for another, when the results are not unexpected, requires only routine skill in the art.

44. Claim 102 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomantschger '166 in view of Dempsey and any or Vanderborgh, Uchida, and/or Grot as applied to claim 82 above, and further in view of Tomantschger '274.

45. The references set forth all the limitations of the claims, but did not explicitly recite the use of a metal oxide protonic conductor electrolyte. Tomantschger '274 teaches in an alternate gas sensor a number of different electrolyte materials useable as for gas sensors including a uranyl hydrogen phosphate tetrahydrate (col. 8, lines 37 and 38). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Tomantschger '274 for the sensor Tomantschger '166 in view of Dempsey and any of Vanderborgh, Grot or Uchida because the substitution of one known electrolyte means for another, when the results are not unexpected, requires only routine skill in the art.

46. Claims 105 and 106 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of any of Vanderborgh, Uchida, or Grot as applied to claim 82 above, and further in view of La Conti.

47. The references set forth all the limitations of the claim, but did not specifically teach the sensor be "adapted" to detect hydrogen or H2S. La Conti teaches in an

analogous sensor that these sensors can be adapted to the detection of materials such as hydrogen and H_2S (see Table 1). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of La Conti for the sensor of Dempsey in order to extend the utility of the sensor to other gases.

48. Claim 107 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of any of Vanderborgh, Uchida, or Grot as applied to claim 82 above, and further in view of Razaq (USP 5,322,602).

The references set forth all the limitations of the claims, but do not explicitly teach the adapting the sensor for use as a water sensor. Razaq teaches that the sensors like those of Dempsey can also be adapted for use as a water sensor (see abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Razaq for the sensor of Dempsey in order to extend the utility of the sensor to other gases such as water.

49. Claim 107 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomantschger '166 in view of Dempsey and any or Vanderborgh, Uchida, and/or Grot as applied to claim 82 above, and further in view of Razaq.

The references set forth all the limitations of the claims, but do not explicitly teach the adapting the sensor for use as a water sensor. Razaq teaches that the sensors like those of Dempsey can also be adapted for use as a water sensor (see abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Razaq for the sensor of Tomantschger '166 in order to extend the utility of the sensor to other gases such as water.

Allowable Subject Matter

50. The examiner has withdrawn the previous indication of allowable subject matter in view of the patentee's broadening of claims 30, 47, 59, and 82 in this reissue application.

Response to Arguments

51. Applicant's arguments filed 1/13/2009 have been fully considered but they are not persuasive.

52. With respect to the broadened reissue claims, applicant urges that the removal of "quantitative" from claims 79-82, 86-89, and 92 does not constitute a broadening because a preamble of a claim is generally not considered to be a limitation of the claim. First, the examiner notes that this argument from the applicant directly contradicts arguments made in the 4/21/2003 appeal brief filed in the 90/006,208 proceedings. In particular, appellant then urged that the examiner had to give weight to the *very same preamble* that the applicant now is urging does not further define the claimed invention (see section i beginning on p. 24 of the 4/21/2003 appeal brief). Applicant's arguments here are inconsistent with previous positions taken. Second, the issue as to whether the preamble further limits a claim is a case by case issue and the preamble oftentimes is deemed to further limit the claimed invention (see MPEP 2111.02). Any change in the language of the preamble might be construed as changing the scope of the claim. On this, applicant appears to be in agreement when applicant

hedges that the preamble "generally" is not considered to further limit a claim. Because applicant is outside of the two-year statutory period for broadening of the claims, it is impermissible for the applicant to make any amendment that may further broaden the interpretation of the claims, especially considering the applicant themselves appears to be confused as to the relevance of the preamble to the claim scope. Third, if the applicant is of the opinion that the preamble change does not change the scope of the claim, then it is unclear why the applicant is insistent on the change in the first place. In other words, if the amendment doesn't change the scope of the claims, then why was the amendment made in the first place?

53. With respect to the changing of "reacting" to "capable of reacting" or "detects" to "capable of detecting", applicant urges that this also is not a difference in claim scope because the change was made to avoid possible confusion as to process language. However, if applicant admits that they are attempting to avoid possible confusion about this limitation, then this evidences that applicant's change does indeed affect the scope of the claims. If "detects" and "reacting" are possibly interpreted differently than "capable of reacting" "capable of detecting", then this change is in fact a change in the scope of the claims.

54. With respect to the combination of Dempsey with any of Uchida, Vanderborgh, or Grot, the examiner is utilizing these references in the same manner as they were in the Examiner's answer of 7/17/2003 in the reexam 90/006,208. The examiner was completely affirmed on issues related to this combination in the decision of 5/23/2007, and it is unclear of the relevance of applicant's continued traversal of the combination of

Dempsey with any of Uchida, Vanderborgh, or Grot. Moreover, the new arguments appear to rely on applicant's interpretation of Nafion as being a "non-hydrophobic binder." This is confusing as Nafion is a well-known hydrophobic polymer. See Razaq (USP 5,322,602) col. 3, ll. 48-52. In fact, Nafion is structurally very similar to the Teflon relied on by Dempsey as both Teflon and Nafion are highly perfluorinated polymers. Hence, it is entirely unclear how applicant came to the conclusion that Nafion was non-hydrophobic.

55. With respect to applicant's arguments concerning La Conti, the examiner's use of La Conti is substantially identical to the use of it in the appealed reexamination of which the examiner was affirmed.

56. With respect to the use of Tomantschger '166, applicant urges that there is no motivation for Dempsey to go from three electrodes to two electrodes as suggested by Tomantschger '166 because Dempsey relies on its reference electrode to account for temperature variations during zero-air operations. This is unpersuasive for a number of reasons.

57. First, the examiner believes the applicant has incorrectly framed the issue. It appears that Dempsey is utilizing its reference electrode not to minimize the need temperature variation *per se*, but rather Dempsey was attempting to account for the temperature variation that was induced by its use of a reference electrode in the first place. In other words, the reference electrode of Dempsey was the source of the temperature variation and relocating it resulted in a minimization of that problem. There should be no current flow between the sensing and reference electrodes of Dempsey,

but some of the flux present between the sensing and counter electrodes did flow to the reference electrode (col. 3, ll. 48-64). If Dempsey were modified to utilize two electrodes instead, then Dempsey presumably would not have had this same problem as there would have been no third electrode functioning as a reference electrode and hence no third electrode to undesirably receive current. The examiner notes that Tomantschger does not discuss the need for any temperature correction or a problem with temperature variations for its two electrode sensor embodiments.

58. Second, even if the examiner accepted that the reference electrode of Dempsey was the solution to the temperature variation and not the problem as the applicant has framed the issue, it is still unclear how this would render the further use of Tomantschger '166 as unobvious. In particular, Dempsey is trying to minimize measured current variations brought about by temperature variations (abstract). However, the sensor of Tomantschger '166 utilizes its two electrodes as a potentiometric or voltage measurement (col. 10, ll. 44-60). Hence, if one is not even measuring current anymore, then any possible current variations as a function of temperature would be irrelevant. Hence, the entire purpose of the reference electrode of Dempsey would thereby be irrelevant and this reference electrode would not be necessary. As discussed above, the whole reason the current variations were present in the first place in Dempsey was a function of its arrangement of sensing, counter, and reference electrodes and how these electrodes were interfaced with each other to an external voltage source. In the simplified electrode structure of Tomantschger '166, this

problem is irrelevant as there is no external voltage source and no induced current flow between the electrodes.

59. Third, again accepting the interpretation of the purpose of the reference electrode as framed by the applicant, this temperature variation would presumably only be an issue if one utilized the sensor in a varying temperature. If the sensor of Dempsey were configured to operate at only a single temperature (e.g. room temperature), then there would be no need for this reference electrode. The claims do not require the invention to be useable at multiple temperatures and the specification and claims only suggests using the sensor at room temperature (e.g. see claim 78). If a feature on a device were no longer needed or desired, then it would have been obvious to remove said feature from the device *In re Karlson*, 136 USPQ 184.

60. Applicant further urges that when Tomantschger '166 teaches a three electrode embodiment (fig. 6), the counter electrode appears to no longer be exposed to a volume of scrubbed air. First, it is unclear how applicant came to that conclusion. There is nothing in the text to suggest the counter electrode of this embodiment operates any different than the counter electrode in all the other embodiments, and the mere fact that Tomantschger '166 did not draft fig. 6 to show details that were present in other figures doesn't by itself suggest anything. Furthermore, even if applicant were correct, it is entirely unclear the point of this argument as the examiner is relying on Tomantschger '166 to show that two-electrode sensor embodiments were known in the art (like fig. 3). How the three-electrode embodiment of fig. 6 operates is irrelevant.

61. Applicant's arguments concerning Nagata appear to parallel the arguments made against Tomantschger '166, namely that Dempsey relies on its reference electrode to account for temperature variations and it wouldn't have been obvious to remove it. This is unpersuasive for the same reasons discussed for Tomantschger '166 above.

62. With respect to the declaration from Dr. Shen, the examiner initially points out that this declaration (hereafter "the '999 declaration") differs in key points from a similar declaration submitted in the proceedings for 10/621,637 (hereafter "the '637 declaration"). In particular, points 10(i)(c), 10(i)(d), 10(iii)(c), 10(iii)(d), 10(v)(c), and 10(v)(d) of the '999 declaration differ significantly from these points in the '637 declaration. However, both of declarations are attempting to tie the claimed subject matter to the commercial success as evidenced by the same royalty payments (point 13 in each declaration). This is confusing because applicant has essentially provided two separate grounds for the commercial success. In the '999 declaration, applicant now deems thickness of the membrane and the size of the sensing and counter electrodes to be critical to the commercial success, whereas the '637 declaration was silent about these points. In the '637 declaration, applicant deemed the use of water vapor permeable components critical to the commercial success, but the '999 declaration is silent about these considerations. The examiner questions whether these differences work against the applicant's assertions in each of the cases. In particular, if the '999 declaration asserts that the claimed electrode sizes and membrane thicknesses were critical to the commercial success, then the fact that the claims in the '637 application do not claim this would appear to evidenced that there is no nexus between the claimed

subject matter of the '637 application and the commercial success as alleged in the '637 declaration. Similarly, if the '637 declaration asserts the importance of the claimed water vapor permeability to the commercial success in that application, the fact that the claims in the '999 applicant do not claim this feature would appear to evidenced that there is no nexus between the claimed subject matter of the '999 application and the commercial success as alleged in the '999 declaration.

63. Points 1-8 of the declaration either review Dr. Shen's background or review the claimed invention. It would appear that no further comment is necessary about these first eight points. For point 9, applicant attempts to relate the improvements of the claimed invention over the prior art gas sensors. However, it is unclear how any of these cited points explicitly stems from the claimed invention. In particular, point 9(i) urges that the CO sensors operate reliably at room temperature. This is no different from Dempsey, which also has ppm level detection at room temperature (col. 2, ll. 30-35 and col. 11, ll. 12-19) without having all the features of the claimed invention.

64. Point 9(ii) is drawn to the fact that the CO sensor does not need recalibration during the sensor lifetime. First, this point would appear to be contradicted by the specification where it states that the sensor does not require recalibration because of the use of the solid electrolyte layer (col. 7, ll. 57-61). Dempsey already teaches the use of the same solid electrolyte layer (i.e. Nafion), hence any claimed distinction between Dempsey and the present invention would not appear to be responsible for the absence of the need from frequent recalibration. In fact, there is nothing in Dempsey that gives any indication that its sensor requires frequent recalibration.

65. Point 9(iii) states that the CO sensors of the present do not consume any power. First, most of the rejected claims do not state anything about a power source so this is not a claimed distinction over the prior art. Second, this point is also contradicted by claims 14, 23, and 35, which explicitly state the presence of pumping electrodes and would inherently require a power source. Third, Tomantschger '166 evidences that potentiometric CO sensors (i.e. sensors not requiring a power source) were already known at the time of the invention and that these sensors did not require the use of electrolyte in the measuring electrode. See the discussion of Tomantschger '166 above.

66. Point 9(iv) states that the CO sensors of the present invention have an improved CO detection accuracy and resolution. However, applicant is making this suggestion in the complete absence of any data to support this conclusion. Unless applicant sets forth data comparing the sensor of the present invention to the sensor of Dempsey, this point by the applicant is entirely speculative and of little use.

67. Point 9(v) states that the CO sensors of the present invention are cheaper to manufacture at a dollar cost. However, the only claimed structural distinction between Dempsey and the present invention is that the present adds Nafion to the electrode instead of Teflon. The examiner presumes Nafion is more expensive that Teflon so it is unclearly unclear how this point relates to the claims.

68. Point 10 concerns the supposed commercial advantages made possible by the claimed features. Point 10(i)(a) and 10(i)(b) concern that the addition of proton conductor to the sensing and counter electrode provides minimal ionic/protonic

resistances and provides a high surface area for three phase contact to occur. This was already well known advantage of adding electrolyte to an electrode in the art. In particular, Grot and Vanderborgh already suggested that adding electrolyte to the electrodes lowered the resistance of the electrodes by improving the three phase interface (Grot col. 4, ll. 26-29 and Vanderborgh col. 2, ll. 37-43). Uchida already suggested added electrolyte to the electrodes increased the reaction area (i.e. three phase contact) of the electrode (abstract).

69. Points 10(i)(c) and 10(i)(d) concern the use of a short ion path and particular size of the electrode. However, Dempsey already discloses membrane thickness in the claimed range and taught electrode diameters that overlapped or were so close as to render obvious the claimed range. See the discussion above.

70. Points 10(ii)(a-c) concern that the sensors do not need recalibration because they are operated at room temperature (a), have a solid electrolyte body (b), and use a mixture of ionic-electronic conductive sensing and counter electrodes (c). Points (a) and (b) are already disclosed by Dempsey and point (c) is already rendered obvious by Uchida, Grot, and Vanderborgh for the same reasons set forth in this declaration. See the discussion of point 10(i) above.

71. Point 10(iii) concerns the fact that sensor does not consume any power. First, as discussed for point 9(iii) above, most of the claims do not even require this and some of the claims (i.e. claims 30, 47, and 59 for example) contradict this point. In fact, only claims 80, 81, 87, 88, and 92 appear to be drawn to an embodiment explicitly lacking any use of a power source. If the claims do not explicitly disclose the supposed

commercial feature, then this point cannot be construed as establishing a nexus between the claimed invention and the commercial success. Second, as also discussed for point 9(iii) above, Tomantschger '166 already disclosed that the supposed use of the mixture of ionic/protonic materials for the electrodes was not a prerequisite for operating a sensor without a power source.

72. Point 10(v) (the examiner notes that there was no point 10(iv)) concerns the improved ppm CO detection accuracy and resolution. However, because the declaration and the specification do not disclose one iota of evidence to back this claim of improved accuracy and resolution, this point is entirely speculative and hence entirely unpersuasive.

73. Point 10(vi) concerns that the CO sensors are cheaper to manufacture because (a) they do not need a reference electrode, amplifier, or DC power source; or (b) the use of a solid electrolyte membrane is simpler. First, point 10(vi)(a) is confusing because applicant even has embodiments of its sensor having a reference electrode (fig. 8, claim 52) and a DC power source (element 42 in fig. 2 or 140 in fig. 5, and claims 2, 30 and 47 for example). Most DC power sources are constructed out of amplifiers. In fact, the embodiments of fig. 3 and 4 actually have more electrodes (4) than the number of electrodes that Dempsey disclosed (3). Second, point 10(vi)(a) ignores the fact that most of the claims of the present invention do not even read away from the use of more than two electrodes with some of the claims explicitly requiring three or more electrodes. The fact that Dempsey discloses the presence of more than two electrodes

does not constitute a claimed distinction. Point 10(vi)(b) is irrelevant as Dempsey already disclosed the use of a solid electrolyte membrane.

74. Points 11-15 are drawn to the commercial success of the present invention. However, because there is no persuasive nexus between the commercial success and the claimed invention (see the discussion of points 9 and 10 above), the degree of commercial success described in these points are granted little if any weight on the issue of obviousness.

Conclusion

75. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAJ K. OLSEN whose telephone number is (571)272-1344. The examiner can normally be reached on M-F 5:30-2:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kaj K Olsen/
Primary Examiner, Art Unit 1795
April 3, 2009